

**REMARKS**

Claims 3, 8, 9, 14, and 19 have been amended to add clarity to the claims.

Claims 3, 5, 6, 8, 9, 11, 12, 14, 17, and 19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hawthorne et al. in view of Maheshwari et al. Applicants respectfully traverse.

With regard to claims 3, 14, and 19, Applicants assert that neither Hawthorne et al. or Maheshwari et al., separately or in any proper combination disclose a solder film directly attached to a heat slug bonding the heat slug to a semiconductor as disclosed in claims 3, 14, and 19. Instead, Hawthorne et al. disclose at column 4, lines 42-44, a thermally conductive adhesive 71. While Hawthorne et al. disclose using solder 84 or adhesive for securing washers 80 at column 6, lines 38-40; solder 94 or adhesive to affix a shoe 86 to a printed circuit board at column 6, lines 53-58; and a fillet 106 of solder or adhesive to secure heat spreader pins to a printed circuit board 104, this is much different from a solder film bonding a heat slug to a semiconductor as recited in claims 3, 14, and 19. Maheshwari et al. is silent as to a solder film directly attached to a heat slug bonding the heat slug to a semiconductor.

To the Examiner's assertion that the adhesive 71 of Hawthorne et al. is the same as the solder in claims 3, 14, and 19, Applicants respectfully disagree. Nowhere in Hawthorne et al. does it state that the adhesive 71 is solder. In fact, Hawthorne et al. teaches away from this. Hawthorne et al. draws a distinction between solder and adhesive, as disclosed in the references above, by using "solder or adhesive" language. In such a context, Hawthorne et al. plainly discloses that solder and adhesive are mutually exclusive elements. Hawthorne et al.,

additionally, limits the use of solder or adhesive to secure washers 80, a shoe 86, and heat spreader pins. To state that adhesive 71 is actually solder is contrary to the teachings of Hawthorne et al. Nowhere, does Hawthorne et al. state that solder is used to bond a semiconductor to a plate. Hawthorne et al., instead, states that adhesive 71 is used. Applicants, thus, respectfully assert that the Examiner's characterization that the adhesive 71 is solder, is incorrect.

Moreover, Applicants assert that neither Hawthorne et al. or Maheshwari et al., separately or in any proper combination disclose a solder bonding metal layer. Instead, Hawthorne et al. is silent as to a metal layer as recited in claims 3, 14, and 19 as admitted to by the Examiner. Moreover, Maheshwari et al. at Fig.2 merely disclose a balance plate without disclosing a solder bonding metal layer as recited in claims 3, 14, and 19.

Claims 2 and 13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hawthorne et al. and Maheshwari et al., and in further view of Haley. Applicants respectfully traverse. Applicants assert that claims 2 and 13 are allowable for their own merits and because they depend from independent claim 3, which the Applicants believe has been shown to be allowable.

Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Hawthorne et al. in view of Maheshwari et al., and in further view of Furukawa et al. Applicants respectfully traverse. Applicants assert that claim 4 is allowable for its own merits and because it depends from independent claim 3, which the Applicants believe has been shown to be allowable.

Claims 7 and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hawthorne et al. and Maheshwari et al., and in further view of Takahama et al. Applicants

respectfully traverse. Applicants assert that claims 7 and 18 are allowable for their own merits and because they depend from at least one of independent claims 3 and 19, which the Applicants believe have been shown to be allowable.

Claims 10 and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hawthorne et al. and Maheshwari et al., and in further view of Jeong et al. Applicants respectfully traverse. Applicants assert that claims 10 and 20 are allowable for their own merits and because they depend from at least one of independent claims 3 and 19, which the Applicants believe have been shown to be allowable.

Claim 15 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Hawthorne et al. and Maheshwari et al., and in view of Wang et al. Applicants respectfully traverse. Applicants assert that claim 15 is allowable for its own merits and because it depends from independent claim 14, which the Applicants believe has been shown to be allowable.

### **CONCLUSION**

In view of the foregoing, Applicants submit that claims 2-15 and 17-20 are patentable over the relied upon references, and that the application as a whole is in condition for allowance. Early and favorable notice to that effect is respectfully solicited.

In the event that any matters remain at issue in the application, the Examiner is invited to contact the undersigned at (703) 668-8029 in the Northern Virginia area, for the purpose of a telephonic interview.

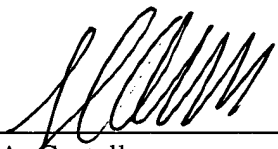
Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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By

  
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Appl. No. 09/464,322

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

*In the Claims*

Please amend the claims as follows:

3. (Amended) A semiconductor chip package comprising:  
a substrate having a plurality of bonding pads;  
a semiconductor chip having a plurality of conductive bumps on a front side thereof, the conductive bumps contacting the bonding pads;  
a heat slug bonded to a backside of the semiconductor chip; and  
a solder film directly attached to the heat slug thereby bonding the heat slug to the backside of the semiconductor chip, wherein the backside of the semiconductor chip includes a solder bonding metal layer formed thereon for strengthening adhesion between the semiconductor chip and the solder film.

8. (Amended) The semiconductor chip package of claim 3, wherein the heat slug comprises a solder bonding [an adhesion] layer formed on a surface of the heat slug that contacts the solder film.

9. (Amended) The semiconductor chip package of claim 8, wherein the solder bonding [adhesion] layer is a layer selected from a group consisting of a Ni/Au layer, a Ag layer, and a Pd layer.

14. (Amended) A method of fabricating a semiconductor chip package, comprising:  
preparing the semiconductor chip having a plurality of conductive bumps on a front surface of the semiconductor chip and a solder bonding metal layer on a backside of the semiconductor chip;

bonding a heat slug on the backside of a semiconductor chip using a solder film; and  
attaching the semiconductor chip on a substrate such that the conductive bumps of the semiconductor chip contact a plurality of bonding pads on the substrate wherein the solder bonding

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metal layer on the backside of the semiconductor chip strengthens adhesion between the semiconductor chip and the solder film.

19. (Amended) A semiconductor chip package comprising:

a substrate having a plurality of bonding pads;

a semiconductor chip having a plurality of conductive bumps on a front side thereof, the conductive bumps contacting the bonding pads;

a heat slug bonded to the semiconductor chip, the heat slug comprising a top portion, side standing portions bent from the top portions, and side end portions bent again from the side standing portions; and

a conductive solder film that bonds the heat slug to the backside of the semiconductor chip wherein [the top portion] the heat slug contacts the [conductive] solder film and the side end portions of the heat slug are attached to the substrate by an adhesive, and wherein the heat slug comprises [an adhesion] a solder bonding layer formed on a surface of the heat slug that contacts the solder film.